

G01 Geodesy General Contributions

VLBI Measurements for Time Transfer between Time and Frequency Laboratories

Hiroshi Takiguchi, Yasuhiro Koyama, Ryuichi Ichikawa, Tadahiro Gotoh, Atsutoshi Ishii and Thomas Hobiger

Space-Time Standards Group, National Institute of Information and Communications Technology

In the usual geodetic VLBI analysis, clock offsets and their rates of change at participating stations except for the reference station are estimated. The averaged formal error (1σ) of the clock offsets is typically about 20 picoseconds in the geodetic VLBI experiments regularly conducted by the International VLBI Service for Geodesy and Astrometry (IVS). This accuracy is better than other techniques like GPS time transfer and TWSTFT (Two-way Satellite Time and Frequency Transfer) which are used to maintain Coordinated Universal Time (UTC). It will become possible to use the geodetic VLBI technique for accurate time transfer if we can collocate the VLBI radio telescopes at Time and Frequency laboratories. For this purpose, we started to develop a compact and transportable VLBI system. In this study, to confirm the potential of VLBI time transfer aiming at the practical use of VLBI time transfer in the future, we compared the results of VLBI time transfer and the results of GPS time transfer (Carrier Phase) by using Kashima-Koganei baseline (109 km). The averaged formal error (1σ) of the clock offsets when they are estimated every one hour was 29 picoseconds. The results of VLBI time transfer were consistent with the results of GPS time transfer. The difference of both results was about ± 500 picoseconds and it is considered to be dominated by the uncertainty of the GPS time transfer. In terms of frequency stability, the Allan deviation was evaluated and it showed that VLBI time transfer is more stable than GPS time transfer in the time range from 2000 seconds to 60000 seconds. Based on these results, we will discuss about the possible improvements to the time transfer between Time and Frequency laboratories by collocating the compact VLBI system at the laboratories.